BCI (S2021) - MID SEM EXAM - Set-B

Total points 9/10

Course Name: Brain Computer Interaction (BCI)
Exam Duration: 1 hour
Total Marks: 25

Instructions:
1. This is a closed book, closed notes exam.
2. You should not discuss questions or answers with anyone (including outsiders)
3. You should have your camera ON at at all times and no headphones
4. Consists of Part-A and Part-B. Part-A consist of 3 descriptive questions. and Part-B consist of 10 MCQ questions
5. For descriptive questions, write down your answers in A4 sheet. And be brief and to-the-point. Answers must be given in ball point pen only. Answers in pencils will not be checked.
6. You should submit the scanned copy of your answer sheet for the respective question only. Don't submit the answer of other question For Ex: Q1 answer should be submitted for Q1 only. Please be careful while uploading the answers.
7. The name of the scanned copy should be the Roll No + '_' + Set No.pdf. (e.g.,S20170010XYZ_SetB.pdf).
Write the name and the roll no. on each page of the answer sheets.
8. Follow all other instructions given by the faculty during the exam. Attempt all questions

Descriptive Type Questions

0 of 0 points

Each Question in this section are of 5 Marks= 5*3=15

Write down your answers in A4 sheet. And be brief and to-the-point. Answers must be given in ball point pen only. Answers in pencils will not be checked.

You should submit the scanned copy of your answer sheet for the respective question only. Don't submit the answer of other question For Ex: Q1 answer should be submitted for Q1 only.

Please be careful while uploading the answers.

What are the techniques currently available for invasive recording of brain signals? Specify for each technique whether they can record spikes from individual neurons.

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Describe the sequence of events that gives rise to an action potential. Start from a volley of action potentials arriving along the input axons to the neuron and trace the biochemical and electrical consequences leading to an output action potential.

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What are some of the strengths and weaknesses of fMRI compared to EEG? Comment particularly on the spatial and temporal resolution afforded by these two methods.

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PART - A

9 of 10 points

MCQ Questions (10*1 = 10)

✓ The invasive technique used to record from multiple neurons 1/1

- [x] Tetrode ✓
- [ ] extracellular recording
- [ ] patch clamp recording
- [x] Multielectrode Arrays ✓

✗ The artifact that is predominant in concurrent EEG-fMRI acquisition 0/1

- (•) chewing ✗
- ( ) Muscle movements
- ( ) Eye blink
- ( ) ballistocardiogram

Correct answer

- (•) ballistocardiogram

✓ Find the odd one out regarding aqueous medium of neurons. 1/1

- (•) Hydrogen (H+) ✓
- ( ) Potassium (K+)
- ( ) organic anions (A-)
- ( ) Sodium (Na+)

✓ Bipolar electrodes are 1/1

- where the potential of each electrode is compared to a neutral electrode
- where the potential of each electrode is compared to the average of all electrodes
- where the potential difference between a pair of electrodes is measured ✓
- Both A and B

✓ How many complex multiplication are required per output data point in FFT algorithm are? 1/1

- [(N/2) log N]/L
- [N log_2 2N]/L ✓
- [(N/2) log_2 N]/L
- [(N) log N]/L

✓ The functions such as breathing, muscle tone, blood pressure, sleep, and arousal is regulated by 1/1

- thalamus
- brain stem
- hypothalamus
- medulla and pons ✓

✓ EEG rhythm that have been reported in tasks involving short-term memory and multisensory integration 1/1

- (●) Gamma wave ✓
- ( ) Beta wave
- ( ) Delta wave
- ( ) Alpha wave

✓ Rapid outflux of K+ions in the cell causes 1/1

- ( ) membrane potential to rise rapidly
- (●) membrane potential to drop rapidly ✓
- ( ) no change in membrane potential
- ( ) With sufficiently strong inputs membrane potential rises

✓ Match the following 1/1

A) fMRI	1) SQUID
B) PET	2) BOLD
C) MEG	3) optodes
D) fNIR	4) radiotracer

- (●) A – 2, B – 4, C – 1, D - 3 ✓
- ( ) A – 2, B – 3, C – 4, D - 1
- ( ) A – 2, B – 1, C – 4, D - 3
- ( ) A – 3, B – 1, C – 4, D - 2

✓ The poor spatial resolution of EEG is caused primarily due to 1/1

- (●) different layers of tissue such as meninges, cerebrospinal fluid, skull and scalp ✓
- ( ) artifacts generated by muscle activity
- ( ) good temporal resolution
- ( ) varying psychological states of the user